# Ingenuity in the Green Mountains

*By* Tom Slayton

*Photographs by* Vyto Starinskas

It's the spirit that metamorphoses an old pair of jumper cables into a gate latch or generates methane gas out of a manure pile; the agile mind that first thinks of boosting sugar-making efficiency by draping plastic sheeting over the boiling pan. The chains welded together into mailbox posts on back roads exemplify it, as do a child's garage-made skibob, the array of baroque apple parers that were invented in Vermont during the mid-1800s, and the latest research on woodstoves and solar-generated electricity. Genius seems too pompous a word for this humble phenomenon. Ultimately it's a matter of everyday life.

Last year, student researchers at the Essex Middle School discovered that no fewer than 23 Vermonters had been issued patents over the years for improvements on the boot. Many of these innovators were only dimly aware of the place they were making for themselves in history. Many of them simply stumbled into their places like Julio Buel, who invented the fishing spoon after he saw a fish bite the tablespoon he accidentally dropped into a lake. Instead of genius, call it ingenuity. By any name, it's a touchstone of Vermont's character.

For the sake of Green Mountain chauvinism, it would be nice to imagine that Vermonters really are sharper and more inventive than other people. But this won't wash. The simple truth seems to be that Vermonters have had more opportunity to be ingenious because Vermont is such a rigorous place. Here, where rural isolation plus a native frugality enforced by climate and circumstance has assured the state an abundant supply of necessity, necessity has truly been the mother of invention. As a result, uncommon ingenuity has been a commonplace component of the Vermont mind for generations.

It is no coincidence that the first federal patent ever issued was issued to a Vermonter. It went to Samuel Hopkins of Pittsford in 1790 for his new method of making pot and pearl ash (substances used in the soaps of that time).

Other patents followed by the thousands. The electric motor, the steel carpenter's square, the platform scale, the steel plow, the first globe made in the United States, the spring clothespin, and hundreds of other items were invented by Vermonters. More recently, residents of the state have been issued patents for everything from solar collectors to computer parts. "Vermonters are very independent-minded," says folklorist Mark Greenberg of Montpelier, who is working on a series of radio profiles of Vermont workers. "Invention is just a part of their daily life. Sometimes the end result can be pretty startling, but the means of getting there is often very commonplace."

The echoes of some historic examples of Vermont ingenuity can still be heard today. Samuel Morey's little steamboat, sputtering around on Fairlee Pond in 1792, predated Robert Fulton's "Clermont" by more than a decade. Fulton even came to Fairlee and looked closely over Morey's boat before building his own. An investigative committee later determined that Morey, not Fulton, should have been credited with inventing the steamboat, but by then it was too late. Fulton sent the *Clermont* up the Hudson to cheers and acclaim, while Morey, in a fit of frustration, sent his boat to the bottom of the lake in Fairlee that now bears his name.

Thaddeus Fairbanks was more fortunate. Fairbanks grew up in St. Johnsbury as the son of a family of millers and ironworkers, but he went on to pattern stoves and plows at the family foundry. Eventually he was granted 32 patents, and redesigned the old-fashioned icebox so that it cooled food more efficiently. He is remembered today, however, as the man who in 1830 invented the platform scale. Much of the elegance of St. Johnsbury's architecture, the Fairbanks Museum with its planetarium and the nearby Athenaeum, are all a direct consequence of the economic prosperity that the Fairbanks Scale Company brought to the inventor's home town.

Equally remarkable was Fairbanks's design for and creation of a manufactory in St. Johnsbury to produce his scales. He built it entirely from scratch. One hundred and fifty-three years later, the company (now renamed Fairbanks-Morse, for yet another innovator) remains a mainstay of the town's economy, although it is now owned by Colt Industries.

Blacksmith Silas Hawes of North Bennington also built a durable industry out of his invention. Shortly after the War of 1812, Hawes welded two saw blades together at a right angle to produce the first steel carpenter's square. It was an immediate success because it lasted longer and was more accurate than the common wooden squares of his day. Hawes patented the device in 1817, and started manufacturing them. The Eagle Square Co. was incorporated in 1859.

Today Hawes would not recognize the descendant of his little mill. The modern plant of the Stanley Tools Co., a division of the Stanley Works of New Britain, Conn., makes some 300 different tools including 40 different types of squares. Notwithstanding this expansion and diversification, the company founded by Silas Hawes recalls its roots with a gilded eagle that is mounted out front.

Paul Harris, foreman of the company's square-making operation, is a member of a Bennington County family that has worked in the Eagle Square plant since

the 1860s. According to Harris, ingenuity is an ongoing tradition at the plant, which employs 265 local people. As he tours the square shop, he can point to a series of machines, some invented by local workers, that have improved the manufacture of squares over the years.

"I can remember the time when 5000 squares a week seemed like the maximum we could make," Harris says. "But with the changes, we're now able to run off more than 40,000 in the same time. It's a whole new ballgame now."

*With the Defiant woodstove, Duncan Syme (above) and Murray Howell set new standards in the industry.*

Across the state in Westminster, vegetable grower Howard Prussack has brought twentieth century technology to the age-old pursuit of farming. Prussack, who says he would not mind at all becoming Vermont's first millionaire vegetable grower, has already built a $270,000 per year business by using his wits on his modest 50 acres of farmland.

At first, all he knew was that there was a market in Windham County for fresh local lettuce year-round, and that Europeans had developed techniques for growing lettuce in greenhouses. Motivated by the former and inspired by the latter, he beat the Vermont winter and now has nearly 3500 heads of Ostenada lettuce growing in peat-pots in his greenhouse.

The only soil for each head of lettuce is the tiny peat-pot in which it sprouts. The sprouts are set in slanted plastic trays through which a slow trickle of fertilized water flows and feeds the plants. Rows of the trays fill the greenhouse, all fed from a well of fertilized water along a side wall. Prussack has just opened a new farmstand near Brattleboro where he will have the lettuce growing all year long, right under his customers' noses.

"It's going to be Vermont's first year-round, pick-your-own operation," he grins. "I can be a farmer year-round now."

Warmth, not light, was Duncan Syme's requirement, but it was still a process of necessity mothering invention that inspired him to invent a stove that has since made his fortune. Syme was the designer, with the late Murray Howell, of


*Dale Guldbrandsen, left, and Paul Harris hold two of the 40 variations on the steel square that have come from Silas Hawes's invention 172 years ago.*

*Unemployment bred opportunity for Dave Covey, who used the free time to invent "Port-Cord."*

PHOTOGRAPHS ON THIS PAGE COURTESY OF LAKE CHAMPLAIN TRANSPORTATION CO.

*A garden hose, a pump and an old spray-paint compressor made it possible for the Lake Champlain Transportation Co. to serve traffic on the lake year-round. Opposite page: Awash in a green sea of Ostenada lettuce that is unaffected by Vermont's climatic vicissitudes, Howard Prussack has good reason to be smiling.*

the now-famous Defiant stove. He recalls that a winter of quiet agony preceded — and produced — the Defiant.

"I heated my house with wood that first winter of 1974," he says. "Mostly green white birch."

His stove generated so much creosote that he had to channel it into pails and troughs. Furthermore, the stove would not hold a fire overnight and the house was never really warm. As he shivered, Syme began collecting data on woodstove and combustion technology.

He and Howell determined to design a stove that could be used either open (like a fireplace) or closed, was good looking and efficient. The result was the Defiant. Syme's company, Vermont Castings Inc., in Randolph, now makes Defiants and several similar smaller stoves. They're a top-of-the-line stove so highly regarded in the marketplace that Vermont Castings

regularly has to fight off identical copies made by other companies.

The company's thorough follow-up service is not an innovation but it is unusual in the hard-bitten world of industry. Last year more than 10,000 owners of Vermont Castings stoves came to the firm's annual party. Syme now runs the largest specialized stove-making company in the world, complete with its own foundry and a line of accessories that ranges from brackets and mitten-racks to in-stove water heaters, but he still remembers: "The clear definition of what we wanted to do came during that long, cold winter of our discontent."

THAT same keen desire for a better way came to Dave Covey of Williamstown as he nervously watched his wife, Angeline, help him saw cordwood with a big rotary saw powered by his tractor. Covey, a careful man who grew up on a Williamstown farm, kept worrying that Angeline might trip or get her clothing caught in the whirring, exposed saw.

He wanted something smaller and safer, more like a chain saw, but he wanted to retain the ease and flexibility of a bench saw. During the winter, while he was laid off from his job in road construction, Covey went to work in his basement with stock metal and a welding torch.

What emerged from his workshop a few days later was a metal bench, much like a sawhorse, with one major difference: bolt a chain saw to it, blade up, and anyone can operate the chain saw with his foot, using it like a bench saw. The modified bench saw can be used for cutting firewood, sharpening cedar posts, and performing rough carpentry. To prevent the kind of accidents he was concerned about with the rotary saw, he included a guard for the upright saw blade. Covey calls it the "Port-Cord" and would like to market it commercially. The patent is pending.

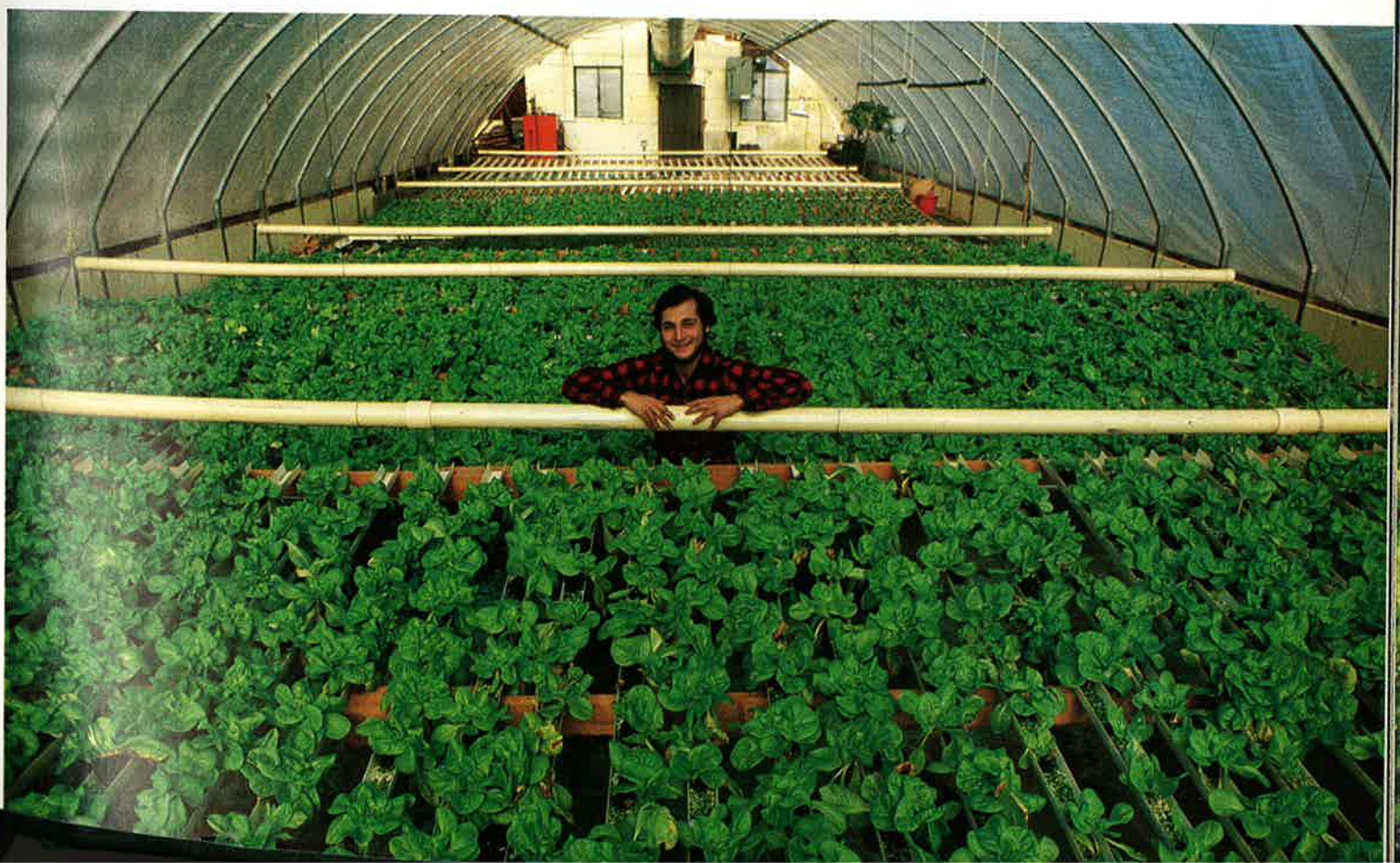
"Growing up on the farm, we always dabbled in making things," he says. "With 12 kids and not a lot of money, if you didn't make it, you didn't have it. That's where it all started, I guess."

FOR John Camm, superintendent of marine operations for the Lake Champlain Transportation Company in Burlington, it all started when his company decided it wanted to run one of its ferryboats across Lake Champlain all winter. Commuters between Plattsburgh, N.Y., and Grand Isle had long depended on the boat's service in summer because it cuts in half the driving distance between Plattsburgh and Burlington. Until 1976, however, the lake's winter ice sheet had blocked cold-weather ferry service.

Camm originally thought he would have to lay a perforated "bubbler" hose from Grand Isle all the way to Cumberland Head, but some preliminary research convinced him the ferry would be able to crunch through any overnight accumulation of ice, even at 20 below, if he could only be sure of getting the boat moving. "You can freeze a boat into the slip very easily," he says. "But if you can get it moving at all, you can easily break thin ice on the open lake."

Having reached that conclusion, Camm took an old spray-paint compressor and a garden hose with holes punched in it and rigged up a bubbler around the slip where the ferry docks overnight. A pump and a section of eight-inch pipe directed a flow of slightly warmer subsurface water that pushed floating ice away from the slip. It worked, and the Plattsburgh-Grand Isle ferry has run on schedule every winter since 1976. Camm estimates that 700 vehicles per day use the ferry in mid-winter.

"There's a demand. The traffic is there," he says, "and it's also been rewarding to keep our crews working longer."




*Jato Coleman of North Wind Power has pioneered in developing graceful and efficient wood rotors for windmills that automatically shut down in high winds.*

DR. James Begun already has one job as a Montpelier optometrist, and does not need to work longer hours. Nevertheless, he recently patented a new type of solar collector that he believes will make direct solar energy more practical in northern regions like the Green Mountain State. Like Syme's stove and several other recent inventions, Begun's collector is a direct result of the energy shortages that hit Vermont hard in the early 1970s.

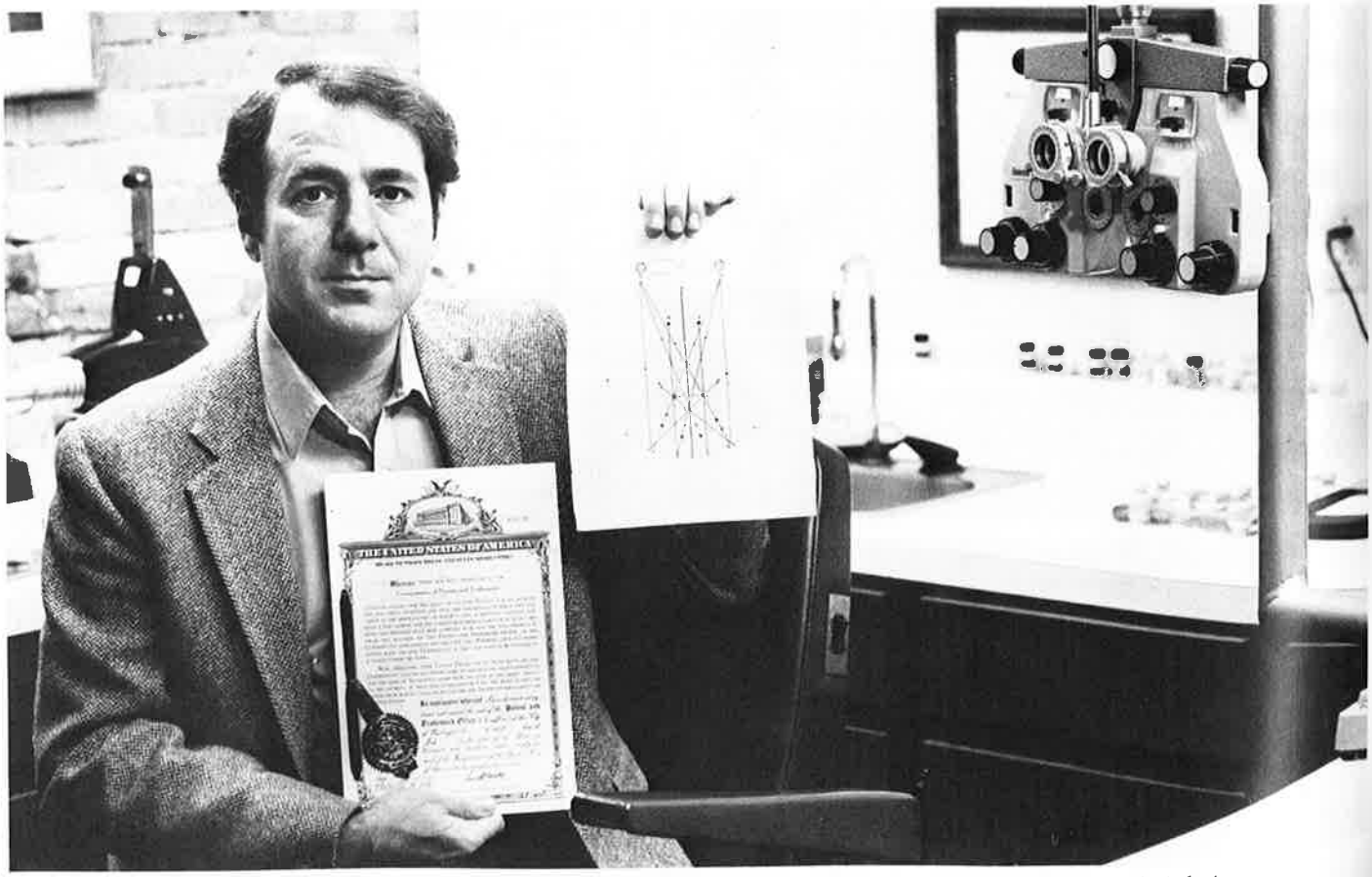
Begun had found, like others, that flat-plate solar collectors (the most common kind) are easy to build, but not very effective in northern climates. Concentrating collectors do a better job of trapping the thin northern sunlight, but have normally required devices to move them so they can continually focus on the sun. He set out to build for his home a combination of both types: a stationary, concentrating solar collector.

Quickly he hit on the principle and began to use his knowledge of optics to build a collector that could focus the sun's light via mirrors into an interior heat collector capable of trapping the sun's infrared radiation, and thereby its heat. "I was up doing calculations and designs night after night," Begun recalls. "Basically, I was playing with the properties of light and optics and the length of solar coordinates."

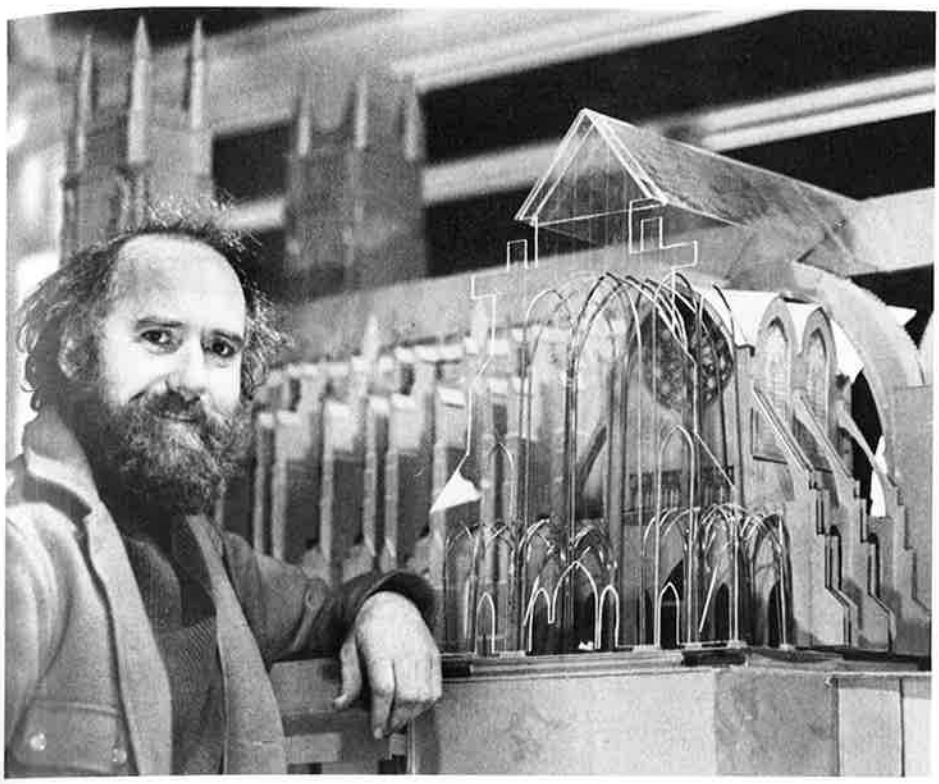
Finally his design clicked. He built a prototype and patented it. Now he's hurrying to put his collector into production. He believes it could transform the market for solar energy technology in Vermont.

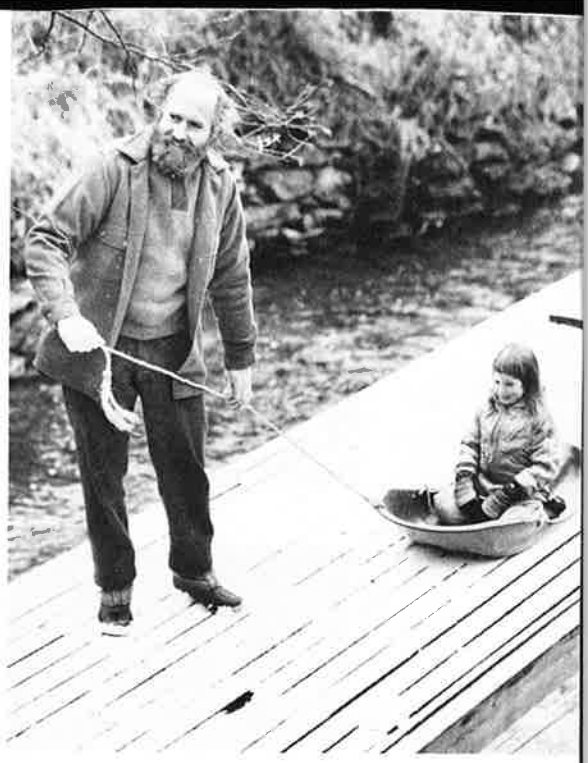
Despite reassurances from experts that it would work, Begun wanted to test his invention himself. Once again, he was honoring a venerable Vermont tradition. He set it out on his lawn on a sunny, cold March day last year and within 45 minutes the collector was too hot to touch. Begun was more than pleased.

LIKE Begun's solar collector, the devices pioneered by Jato Coleman of North Wind Power in Waitsfield are a far cry from Sam Hopkins's pot and pearl ash. Coleman's creations are complicated to the point of being difficult to explain without technical drawings and thousands of carefully chosen words. What he has invented, however, are rotor control devices that enable windmills to turn safely and efficiently in




*In northern regions where sunlight can be thin and scarce, James Begun's stationary, concentrating solar collector may transform the industry.*





*To David Sellers, the world presents innumerable creative opportunities. Here he is with his designs for the Cathedral of St. John the Divine and a sled.*

mild winds and to shut down in high winds so they won't be damaged. Coleman has also pioneered a process for building a wooden blade that is stable and efficient, and that has a greater fatigue strength than steel, in addition to being graceful and beautiful.

North Wind Power makes top-of-the-line windmills that are known for their reliability. The kind of inventing practiced there regularly treads the outer edges of the possible. At the moment, the firm is designing a complex of windmill units to be strung on a network of cables between two California hills above windy Altamont Pass. It is called "Windwall," and Coleman believes it will generate more than 100 megawatts of power when it is finally in place.

"We wanted to come in with a new concept," he says. "It's cheaper than towers and produces more energy per acre." According to Coleman, grand-scale devices such as Windwall will help California replace with wind much of its present nuclear generating capacity before the turn of the twenty-first century.

North Wind's founder and former president, Waitsfield architect David Sellers, helped with the Windwall concept, and is now in charge of advanced systems for the company. He is less of a technician and more of an idealist and dreamer than either Coleman or Begun, and he believes that Vermont's easygoing informality, its rough climate and beautiful topography promote mental creativity.

Sellers's creativity is evident from the moment you enter his rambling, unconventional home overlooking the Mad River Valley. Among its novelties are walls built so they open outward in the summer and close in the winter. "I wanted to explore architecture with a sense of discovery," Sellers says. "A house should be like a flower, or a jacket you take on and off: It should open and close with the seasons."

Not all of the ideas work that percolate out of Sellers's busy mind. He once attempted to build a house by spraying forms carved out of snow with concrete and foam insulation. "The house was fine, but it was so well insulated that it took six months for the snow to melt out from between the walls," he says, laughing.

Nevertheless, Sellers hits more often than he misses. His own current projects involve elements of architecture, technology, and social engineering. One of his current projects is overseeing the completion of the Cathedral of St. John the Divine in New York. Sellers won the competition to redesign the church with his plan for a glass and cast iron south transept enclosing a greenhouse. Visible within the greenhouse will be the stone vaulting and Gothic interior of the church, along with its surrounding gardens and trees. He is also developing a completely self-sufficient research center in the Caribbean for the Cousteau Society, planning a holistic health community on 400 acres in West Virginia, and helping to build a natural-process winery in California that will be tunneled into the rocky hillside where the grapes grow.

In his spare time, Sellers has plans to revamp the winter recreation industry in Vermont. He has designed and built a prototype of a lightweight fiberglass sled that he thinks is less expensive, less wasteful of resources, more fun, and more healthful than traditional downhill skiing.

David Sellers is convinced that mankind stands at the brink of a new golden age. The classic wind generator turning lazily on the ridge above his house is a reminder that he is not an idle dreamer. He is practical enough to have brought several of his dreams to fruition, North Wind Power among them. It is almost possible in his presence to believe in the prospects of his new golden age.

After all, making visions work is what Vermont ingenuity has always been about. One needs only to consider all the Vermonters in the state's past who believed in better apple parers and better boots. Sellers is just applying an old principle on a slightly grander scale.